COOKING FOR KIDS: CULINARY TRAINING FOR SCHOOL NUTRITION PROFESSIONALS REDUCES USE OF CONVENIENCE FOODS WITHOUT NEGATIVELY IMPACTING ENTRÉE, GRAIN OR FRUIT CONSUMPTION

By

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COOKING FOR KIDS: CULINARY TRAINING FOR SCHOOL NUTRITION PROFESSIONALS REDUCES USE OF CONVENIENCE FOODS WITHOUT NEGATIVELY IMPACTING ENTRÉE, GRAIN OR FRUIT CONSUMPTION

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Abstract: The 2010 Healthy Hunger-Free Kids Act changed requirements for school meal nutrition, but created implementation barriers for schools including lack of kitchen infrastructure, lack of staff time and culinary skills to prepare meals, and concerns that students would not be accepting of new foods. *Cooking for Kids*, developed under the principles of the Community Readiness Model, utilizes professional chefs to teach essential culinary skills and on-site consultations to address menu planning related practices specific to a school district. The objectives of this study were to determine if *Cooking for Kids* culinary training affected 1) availability of scratch-prepared foods in school meals, 2) the extent to which marketing strategies were implemented at post-intervention and 3) students' meal component consumption before and after training. A meal component consumption analysis was conducted in spring 2014 (681 matched trays) and fall 2016 (537 matched trays) in three pilot schools. Personal interviews were conducted with the Child Nutrition Director (CND) at each school to evaluate changes in the use of convenience foods from pre- to post-intervention and to determine the extent to which schools had incorporated marketing strategies at post-intervention. Schools used fewer highly processed (convenience) foods for entrees and offered more salad bars. There was no negative impact on entrée consumption (p= 0.878), an increase in grain (p= 0.011) and fruit ($p\leq$ 0.00) meal components and a decrease in vegetable consumption ($p\leq$ 0.00). If schools focus on preparing food from scratch, students' consumption of some components of the school meals may improve. Further use of marketing strategies, especially for vegetables, may be beneficial. The *Cooking for Kids* project is funded by the Oklahoma State Department of Education in Child Nutrition Services through USDA Food and Nutrition Services.

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CHAPTER I

INTRODUCTION

Childhood obesity continues to escalate as a public health concern, threatening children with physiological, psychological, social and emotional consequences.[1-3] Nationally and within the state of Oklahoma, Youth Risk Behavior Survey (YRBS) data shows that the percentage of obese high school students continues to increase.[4,5] While there are multiple factors contributing to obesity, the core contributor is energy imbalance, where energy intake (i.e. dietary consumption) exceeds energy output (i.e. physical activity).[2,3] Looking at dietary consumption and physical activity trends in Oklahoma, fruit and vegetable intake is inadequate and physical activity is minimal.[6] National surveillance data reflects many Americans are consuming excessive amounts of foods high in added sugar, saturated fat and sodium (i.e., energy dense foods).[7] Literature suggests that environments help to determine behaviors and that national, state and local policy should focus on addressing environmental changes to combat childhood obesity.[1]

To target childhood obesity and food insecurity, the Healthy Hunger-Free Kids Act (HHFKA) was passed by Congress in 2010.[8,9] Under this act, the United States Department of Agriculture (USDA) was required to revise the National School Lunch Program and National School Breakfast Program (SBP) to align nutrition standards with the Dietary Guidelines for Americans (DGA).[8,9] Unfortunately, since these changes, participation in the NSLP has decreased

and barriers to meeting the standards impeded progress.[10] There has also been an increased amount of food waste, as seen in several plate waste studies after the nationally mandated meal requirements.[11-13]

Since the NSLP changes went into effect for School Year 2012-2013, there have been efforts to change the lunchroom environment in the hopes of altering consumption and food waste patterns for the better. Some of these efforts include the implementation of *Smarter Lunchrooms* practices and the utilization of professional chefs.[14]

Prior to development of the *Cooking for Kids* program, there was limited use of professional chef interventions in Oklahoma and these were limited to the larger school districts. To address barriers to implementation of the new NSLP meal changes, the Oklahoma State Department of Education and Oklahoma State University Department of Nutritional Sciences partnered to develop a culinary training program referred to as *Cooking for Kids.* The aim of the program is to increase availability of freshly prepared foods while promoting students' participation and meal consumption.[15] Up until now, the effect of *Cooking for Kids* on students' consumption patterns was unknown. This study focused on the effect of *Cooking for Kids* on students' consumption of nutrient-dense foods.

Purpose

The primary goal of this study was to measure consumption of meal components after the implementation of *Cooking for Kids* in 3 pilot schools and compare findings to the same participating pilot schools in the baseline study conducted in spring 2014. Secondary goals were to determine if *Cooking for Kids* had an effect on availability of freshly prepared foods offered to students and to determine the extent to which marketing strategies were implemented.

Hypotheses

The hypotheses are:

1) After implementation of *Cooking for Kids*, students will increase consumption of entrée meal component.

2) After implementation of *Cooking for Kids*, students will increase consumption of grain meal component.
3) After implementation of *Cooking for Kids*, students will increase consumption of vegetable meal component.
4) After implementation of *Cooking for Kids*, students will increase consumption of fruit meal component.

Research Questions

1) To what extent were schools using *Smarter Lunchroom* marketing practices at post-intervention?
2) Will schools use less convenience preparation methods for entrees after *Cooking for Kids* compared to before the intervention?

Objectives

Objective 1: Analyze meal component consumption (i.e. entrée, grain, vegetable and fruit) after the implementation of *Cooking for Kids* in 3 pilot schools and compare findings to the baseline study.

Objective 2: Conduct personal interviews with Child Nutrition Director at each school to review school menus and quantify the frequency of convenience, minimum preparation, almost scratch and scratch food preparation methods offered each week before and after the implementation of *Cooking for Kids*.

Objective 3: Conduct personal interviews with Child Nutrition Director at each school to determine the extent to which *Smarter Lunchroom* marketing techniques were implemented at post-intervention.

Abbreviations, Terms and Definitions

CDC- Centers for Disease Control and Prevention. A health, safety and security protection agency of the United States that conducts scientific research and responds to health threatening outbreaks.[16]

Body Mass Index (BMI)- an assessment measure correlated with other direct measures of body fat. It is calculated by dividing body weight in kilograms into the square of height in meters. For children and adolescents, BMI is represented as a percentile plotted on the CDC gender- and age-specific growth charts (BMI-for-age).[17]

Childhood obesity- BMI falls at or above the 95th percentile on the CDC BMI-for-age growth chart for children of the same age and gender.[17]

Childhood overweight- BMI falls at or between the 85th and 95th percentile on the CDC BMI-for-age growth chart for children of the same age and gender.[17]

DGA- Dietary Guidelines for Americans, 2015. National report published every five years by the United States Department of Health and Human Services and United States Department of Agriculture. The report provides nutritional guidance for food assistance and nutrition programs to promote healthy lifestyle choices and dietary recommendations for individuals over the age of 2 and families.[18]

HHFKA- Healthy Hunger-Free Kids Act. Passed by Congress in 2010, reauthorized the Child Nutrition Programs and authorized the United States Department of Agriculture to align the National School Lunch Program and National School Breakfast Program meal patterns and nutrition standards with the U.S. Dietary Guidelines for Americans of 2010.[9] The purpose was to address childhood obesity, hunger and food insecurity.

NSLP- National School Lunch Program. A federally assisted meal program through the United States Department of Agriculture established under the National School Lunch Act to daily provide public, nonprofit private and residential child care institutions with nutritionally balanced meals for children.[19]

SBP- National School Breakfast Program. A federally assisted meal program through the United States Department of Agriculture that provides cash subsidies to public, nonprofit private and residential child care institutions for breakfast meals that meet the federal requirements.[20]

Smarter Lunchrooms Movement- Developed by the Cornell Center for Behavioral Economics in Child Nutrition Programs with the goal of providing evidence-based behavioral economics principles to redesign the lunchroom in a way that guides children to choose smarter, healthier food options.[21]

USDA- United States Department of Agriculture. A federal executive department focused on promoting agriculture production and preservation of natural resources. The department consists of 29 agencies including Food and Nutrition Service (FNS) which administers the NSLP and SBP.[22]

YRBSS- Youth Risk Behavior Surveillance System. This national monitoring system helps identify youth health-risk behaviors such as obesity. In addition to the national evaluation surveys, there are also state surveys.[23]

CHAPTER II

REVIEW OF LITERATURE

Childhood Obesity

Childhood obesity is a growing national public health concern that needs urgent attention. According to data from the 2013 Youth Risk Behavior Survey (YRBS), 14% of high school students in the United States were obese, while 12% of youth in Oklahoma were obese.[4,24] The prevalence of obesity among Oklahoma youth increased from 12% to 17%, as reported by the 2015 Oklahoma Youth Risk Behavior Survey (YRBS).[5, 24] Further, in 2015, 15% of Oklahoma youth were overweight.[5,24] As such, approximately one in three Oklahoma youth are either overweight or obese. Weight status is measured as Body Mass Index (BMI), which is calculated by dividing weight (kg) by height (m^2).[17] The Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts are used to express BMI as a percentile relative to other youth of the same age and gender. The growth charts are used for children and youth ages 2 through 20 years of age. The percentiles are used as a health screening tool. Youth that fall at or between the 85^{th} and 95^{th} percentiles are classified as overweight and youth that fall at or above the 95^{th} percentile are classified as obese.

The consequences of obesity potentially affect several areas of a child's life. Obese children begin facing many comorbid conditions such as diabetes and high blood pressure that, unfortunately, follow them into adulthood.[1,2] Not only do obese children face obvious physical

challenges, they also have an increased risk of experiencing social, emotional and psychological stress in their lives.[1,3] Socially, obese children are often bullied and unaccepted by their peers, which can lead to poor behavior in school and a lack of self-esteem.[1,3] Academically, obese children tend to perform poorly compared to children of normal weight.[1,2] In addition to weight status, the low-quality diets consumed by obese children that lack nutrients affect academic performance in that it hinders the child's focus and attentiveness.[2]

Obesity also has significant economic consequences. Obesity profoundly contributes to the healthcare costs in the United States and creates financial burdens for families.[2] The estimated annual healthcare cost for obesity-related illnesses ranged from $147 billion to $210 billion. For childhood obesity, specifically, the additional annual cost of healthcare treatment and hospital visits for overweight and obese children was about $14.1 billion.[2] The State of Obesity Report (2015) suggested that policy and community program development should focus on effective obesity preventative strategies that promote dietary balance and physical activity.[2] These strategies could help avoid extra doctor visits, expensive medication, and hospital admissions, which could ultimately help contain healthcare costs.

Factors Contributing to Childhood Obesity

Obesity is characterized by a ratio of high adipose tissue to low lean body mass.[2] Obesity develops when calorie or energy intake far exceeds energy output, which creates an energy imbalance. To address the imbalance, both dietary consumption and physical activity trends need to be assessed and targeted for prevention.[3] In terms of energy expenditure, the 2014 Oklahoma State of the State's Health Report indicated Oklahoma ranked 44th compared to other states for physical activity; at least one-fourth of the adult population is not physically active.[7] Inactivity is also relevant to youth. Data presented in the Oklahoma 2015 YRBS indicated 12% of youth did not participate in physical activity to meet their recommended goal of 60 minutes any day.[5] In this case, physical activity includes any activity that raises heart rate and breathing. While there are national recommendations for physical activity in place, schools are not placing enough

emphasis on the importance of reaching daily physical activity goals for children due to competing priorities and limited funding.[1]

Poor dietary habits also contribute to overall energy imbalance that leads to obesity. The 2014 Oklahoma State of the State's Health Report presented that 50% of the Oklahoma adult population consumed less than one piece of fruit each day, if they ate fruit at all.[5] Out of 50 states, Oklahoma ranked the lowest for fruit consumption and 44th on the list for vegetable consumption. Looking at youth in Oklahoma alone, 44% and 40% consumed less than one fruit and vegetable each day, respectively. While fruit and vegetable consumption was low, consumption of energy-dense foods was high.[7]

According to the 2015 Dietary Guidelines for Americans (DGA), foods with added sugars and saturated fats contribute to excess calorie consumption.[18] When looking at the total percentage of added sugars in the diet of the U.S. population, there were a variety of contributing sources.[18] The majority (78%) of added sugar sources included snacks and sweets (31%) and sugary beverages (47%), which included sports drinks, soft drinks, sugary fruit drinks, coffee, tea and alcoholic beverages.[18] The total percentage of foods high in saturated fats in the diet of the U.S. population could be broken down into mixed dishes (35%), which included foods such as hamburgers, pastas, tacos and pizza, snacks and sweets (18%), protein foods (15%), and dairy (13%).[18] According to the School Nutrition Dietary Assessment Study-IV, these foods were often found on school menus, and may have contributed to the fact that almost half of schools served meals that exceeded the USDA school nutrition standards for saturated fat.[25] The data from this study was collected before the required NSLP meal changes in 2012. As mentioned above, high calorie diets with minimal physical activity contribute to obesity.

This is concerning because children are at school for most of their waking hours and consume the majority of their daily calories at school.[1] It is logical that current trends reflect children and youth are consuming higher amounts of high calorie foods that are replacing fruits and vegetables.[1,18] There is a risk that the pattern of obesogenic behaviors being developed during

childhood will carry into adulthood, thus perpetuating poor health outcomes among the American population.[1,18]

The Institute of Medicine (IOM) formed the Committee on Accelerating Progress in Obesity Prevention in the hopes of developing obesity prevention strategies and recommendations to combat the growing obesity epidemic.[1] The committee identified five interrelated environments to focus their recommendations: (1) physical activity, (2) food/beverage, (3) message, (4) healthcare/work and (5) school. Addressing these five focus areas as a system allows the initiation of change not only in individuals, but families and communities as well. Obesity influences all of these sectors. The committee's strategies for the school environment, specifically addressed physical education and activity requirements, evidence-based dietary standards that apply to all foods available in schools and, lastly, nutrition education in the classrooms.

The IOM report suggested that while genetics do contribute to obesity, it is primarily environmental factors that explain the nation-wide obesity epidemic.[1] Obesity prevention starts with creating supportive food and physical activity environments. For the scope of this paper, schools are the target environment for childhood obesity prevention. The IOM reported also acknowledges that federal, state and local policy efforts that support obesity prevention are necessary to help change the school environment.

School Focused Efforts to Address Obesity

With childhood obesity at the forefront of public health concerns, the 2010 Healthy Hunger-Free Kids Act (HHFKA) authorized the United States Department of Agriculture (USDA) to align the National School Lunch Program (NSLP) and National School Breakfast Program (SBP) meal patterns and nutrition standards with the U.S. Dietary Guidelines for Americans.[8,9] Consistent with the Dietary Guidelines, these changes required schools to provide students with more whole grains, fruits, and vegetables, fat-free and low-fat milk options.[8] Along with these requirements, school meals were also required to have limited amounts of sodium,

saturated fat, zero trans-fat and be within age appropriate calorie ranges. Appendices A-C compare the previous meal standards to the new meal standards (as of 2012) for the NSLP and SBP.[26] Additionally, Appendix D presents the meal pattern requirements under the new changes.[27] Essentially, these changes, made in July of 2012, passively encouraged the school nutrition professionals to prepare more meals using fresh, minimally processed foods.

In summary, children spend a significant amount of time each day at school and consume about half of their daily calories while they are at school.[1,28] Schools are an optimal place to promote healthy behaviors and obesity prevention because they are able to target a high volume of students.[1,2] The NSLP and Dietary Guidelines, collaboratively, address nutritional changes in the lunchroom on a national level.

Barriers in Implementing the 2012 School Meal Nutrition Standards

The aim of the 2012 school meal pattern revisions was to address childhood hunger and obesity. A recent poll, conducted by the Pew Charitable Trusts, reported 72% of parents claimed they supported the school meal requirements and 91% were in favor of increased fruit and vegetable options with each meal.[29] Despite parental support, there has been a decrease in average daily participation in the National School Lunch Program nationally and within the state of Oklahoma.[10] Table 1 presents a summary of the changes in participation rates from 2011 to 2015. Average daily total participation was calculated using an attendance factor and average daily meals for a nine-month period. Keeping in mind that the changes were made in July of 2012, the United States went from having an average daily participation of 31,841,204 students in FY 2011 to 30,683,143 students in FY 2013. Nationally, average daily participation continued to decrease through 2014 to 30,459,400 students, but as of 2015, daily participation was showing a slight increase to 30,490,536 students. Following the national trend, Oklahoma's average daily participation dropped between FY 2011 (452,426) and FY 2013 (437,992). Oklahoma's NSLP participation appears to have increased since 2014; however, enrollment has also increased. Therefore, the percentage of participating students enrolled has stayed the same since FY 2014.

While these slight participation increases since the NSLP meal changes show improvement, participation nationally and in Oklahoma have yet to reach the levels prior to the regulatory changes. This data suggests the new meal requirements have not been as well accepted by students and child nutrition professionals as the USDA hoped. For these reasons, there is a need to investigate barriers that school nutrition professionals may be having in preparing meals that not only meet the regulations, but also appeal to students.

Table 1 NSLP Average Daily NSLP Total Participation (as of April 2017)[10]

	FY 2011	**FY 2012[a]**	**FY 2013**	**FY 2014**	**FY 2015**
United States	31,841,204	31,653,175	30,683,143	30,459,400	30,490,536
Oklahoma (% of Total Enrollment[b])	452,426 (68.8)	446,144 (66.9)	437,992 (65.0)	439,386 (64.6)	440,444 (64.3)

[a] school meal pattern changes took effect in July of FY 2012
[b] Total Oklahoma student enrollment for each school year based on the respective Low Income Report[30]

Other barriers to overcome in order to meet the new meal standards are the lack of kitchen infrastructure and school nutrition professionals' culinary skills to cook from scratch while maintaining acceptable flavor profiles. According to a 2013 report by the Kids' Safe and Healthful Foods Project, only 12% of school districts in the U.S. had the appropriate kitchen equipment to meet the new meal requirements.[31] The needed equipment and upgrades range from walk in storage areas to electrical upgrades. The report found that a little less than half (42%) of the schools had budgetary room to purchase new equipment. Without appropriate kitchen equipment, schools face a major obstacle that must be overcome before they can take a step toward meeting the new meal standards. To help address some of these issues, the School Food Modernization Act was introduced.[32,33] This act would help provide loan and grant assistance to schools in order to help fund commercial kitchen equipment and cafeteria upgrades. In addition to funding, this act would also provide employee training support for those working in school food

service so they have the proper training they need to meet the new meal requirements. Currently, the act has only been introduced and not yet passed into law.

These barriers were consistent with a 2014 study that used focus groups with Oklahoma school nutrition professionals to assess their willingness and preparedness (i.e., readiness) to decrease the use of highly processed foods and offer more foods using scratch preparation methods.[34] The multiple concerns shared by the school nutrition professionals included cost of food, lack of preparation time, access to appropriate kitchen equipment and preparing meals that are appealing to students. As a result of these limitations, the study participants did not feel empowered to make the changes and lacked motivation because they did not expect the new meals to be well accepted.

Child nutrition professionals play a crucial role in helping children meet their nutritional needs. They must not only have the skill and mindset to prepare healthy meals but also be equipped with creating an environment that encourages students to participate in the program and select healthy foods. Wansink, author of *Slim By Design*, mentions how it can be difficult to make someone, who has worked in the school cafeteria for decades, change the foods they are serving.[35] Wansink and his colleges have "found that the biggest determinant of whether a student eats a school lunch is how much he likes the lunch lady."[35] Cialdini referred to being likable as a principle of influencing a person's behaviors and decision making.[36] Another factor of influence is professionalism both in personal appearances and the environment. Preparing meals that meet the updated meal standards not only requires skill and resources, but also motivation to create an environment in which students are encouraged to select healthy food options.

Smarter Lunchrooms Movement

To create healthy environments in the school setting, Wansink and colleagues have promoted the *Smarter Lunchrooms Movement*.[35] It has been said that healthy foods are not healthy until they are eaten.[37,38] The movement utilizes behavioral economics strategies to influence students' selection of healthier food choices in the lunchroom. Behavioral economics

utilizes the concept of libertarian paternalism that focuses not on removing foods from the lunchroom, but instead focuses on the placement and presentation of foods in a way that influences students' selection of healthier foods, while still preserving their freedom to choose.[14,37] Focusing changes on convenience and palatability is important because they shape the way people choose food.[38] Cohen et al. described how the use of choice architecture strategies can ultimately promote healthier eating habits by simply making a few changes that expose consumers to healthier alternatives compared to what they would typically choose.[14] These efforts are consistent with the report from the IOM Committee on Accelerating Progress in Obesity Prevention that suggested, "Prevention rests on the ability to modify factors that shape individual choices, as well as behaviors that are natural and unconscious responses to environmental cues and situations."[1] These words echo the purpose of a *Smarter Lunchroom*.

Both schools and students receive benefits when *Smarter Lunchroom* strategies are incorporated. For example, changing something as simple as the location of fruit in the lunch line or assigning creative names to the vegetable choices can actually increase fruit and vegetable consumption.[37] In one *Smarter Lunchrooms* study conducted after the guideline changes in 2012, middle school students consumed 18% more fruit and 25% more vegetables when they were exposed to a convenience line with healthy options.[38] Additionally, *Smarter Lunchroom* practices are both time and cost efficient; the changes can be made within a matter of hours and, in most cases, the school will spend very little to make the changes.[37]

Transforming a cafeteria into a *Smarter Lunchroom* depends on changes such as creating convenient access to the healthier food options. A study conducted in a high school in New York sought to determine the impact of a convenience line on consumption.[38] Data was collected for four non-consecutive days where 482 observations were collected after the implementation of the convenience line. Researchers from the *Smarter Lunchrooms Movement* found that by placing healthier foods in a convenience line, students were more likely to choose these foods. However, in this particular study, this did not translate into the consumption of the more nutrient-dense

foods. Of note, the consumption of the unhealthy food options did decrease by 28%. While the students were not necessarily eating more nutrient-dense foods, they were being introduced to healthier options and consuming less unhealthy foods.

A recent 2015 study effectively used a combination of intervention techniques: professional chefs and choice architecture.[14] The chefs focused their efforts on culinary instruction and helping the cafeteria staff create entrées that would appeal to the students. The choice architecture intervention focused on modifying the actual lunch line and improving food presentation. For example, vegetables were offered first on the serving line, fruits were placed next to the cash registers in attractive containers and all fruits and vegetables were promoted using signs and images. The objective was for these strategies to collectively increase students' consumption patterns. Interestingly, in this study by Cohen et al., choice architecture only had an impact on the way students selected foods, while the chef intervention of the study had a positive impact on both the selection and consumption patterns of fruits and vegetables.[14] The interventions were evaluated by measuring plate waste as students ended their lunch period. In conclusion, this study determined that by integrating choice architecture and the efforts of a professional chef, students are not only more likely to select healthier foods, they are also more likely to consume what they selected because they enjoyed the taste.

Overall, these studies show that a combination of environmental and skill building interventions can have a substantial positive impact on selection and consumption patterns in school cafeterias.

Chef Interventions

By introducing professional chefs to the school lunchroom environment to increase palatability, children may start to consume the healthier options they are offered and decrease food waste.[39] Several studies have introduced chefs to help improve preference and consumption after the changes to the NSLP. One study conducted in New York schools, in collaboration with the *Chefs Move to Schools* program, found that when chefs prepared the entrees and sides, high

school student participation increased.[39] While it is important to note the chefs focused on revising historically favored entrees such as pizza and burgers, and overall there was a 39% increase in the total entrée servings consumed.[39] The researchers also found that cooked vegetable consumption decreased when a salad bar was introduced leading to a 17% increase in vegetable serving consumption and a 133% increase in the total vegetable servings consumed.[39] The researchers suggest that professional chefs could potentially play a role in increasing fruit and vegetable consumption in schools.

A pilot study conducted in Boston middle schools closely relates to the *Cooking for Kids* program. The researchers brought in professional chefs to train and interact with the child nutrition professionals of these schools.[40] They chose to target the staff because their lack of food preparation skills was a barrier when trying to incorporate the new meal standards. Ultimately, the goal of the study was to improve student selection and consumption patterns while meeting the NSLP meal requirements. Although not many changes were seen in selection patterns, students increased weekly vegetable consumption by two servings, which was measured by using a plate waste method. Unfortunately, these differences were not seen with fruit consumption. One drawback of this study was that consumption was only evaluated on two consecutive days at each school. Interestingly, the findings were similar to those of the study, mentioned previously, conducted in New York.[39] The Boston study did not mention the use of choice architecture or *Smarter Lunchroom* practices in collaboration with the chef trainings.

Plate Waste Studies to Assess Interventions

In response to an increased amount of food waste after the changes in the NSLP, a study by Hanks, Wansink and Just was conducted to determine the best method for measuring plate waste.[41] There are several ways to conduct plate waste studies as an evaluation method in school lunchrooms. However, in terms of reliability, accuracy and time efficiency, the quarter-waste method seems to be the best option. The quarter-waste method is used to determine how much of each food component is consumed using visual estimations of quarter fractions (none, ¼, ½, ¾ or

all).[41] Visual estimates can be determined on-site or by using a photograph with an identification number. Because measurements in the quarter-waste method are based on a visual estimate, consumption of packaged foods, such as milk, are difficult to measure. In terms of time efficiency, the research team reports that when using the photograph and quarter-waste method, it only takes about 8 seconds to estimate the food waste.

The researchers evaluating the quarter-waste method identified several limitations to their study.[41] First, they note that measurements would be even more reliable if the quarter-waste method were to be performed on several days and not just one day to allow for a variety of food evaluations. The second limitation to their study was that they did not take pictures or record what was on each tray before consumption. This hindered the researchers from knowing if there were foods on the tray at the beginning that did not appear to be on the tray at the end of lunchtime. The researchers also suggest that biases should be reduced as much as possible. Biases can include your population (i.e., students) questioning the purpose of your study, in which case researchers should give them a general answer with no suggestions to the purpose.

In summary, this study helped identify a simple way to get a true depiction of the types of foods being wasted in the school cafeteria.[41] This information can help school nutrition professionals identify ways to reduce the amount of food being wasted and identify what foods appeal to students.

Schwartz et al. initiated a plate waste study to help answer several questions. The first question being the effect of the change in school meal regulations on consumption of healthy foods and second, changes in food waste.[11] The study sought to compare the selection and consumption patterns before and after the implementation of the new meal requirements. After the USDA meal changes were made, the study found that fruit selection increased, while vegetable selection decreased. While vegetable selection decreased, consumption of the vegetables that were selected increased. The greatest amount of change in vegetable consumption (19% increase) was seen in the second year after the meal changes. There were no significant

changes in fruit consumption patterns. Overall, as reflected by plate waste from this study, the nationally mandated meal standards did not negatively impact fruit consumption and vegetable consumption increased.[11]

Plate waste was used as a method to evaluate student receptiveness to meal changes that exceeded the NSLP requirements in a study conducted in four Los Angeles middle schools.[12] Vegetable and fruit waste were measured for five consecutive days. Generally, vegetables, more specifically salads, were more wasted than fruit and the fruit waste consisted of whole fruit. A lack of baseline data was a limitation of this study. The researchers discussed that cafeteria managers may be offering fewer healthy options to decrease plate waste because they know students do not choose them when going through the lunch line. Again, if this is happening, it reaffirms why cooperation from school nutrition professionals is essential because it is logical that consumption cannot occur without selection.

Much like the findings from the middle school students in Los Angeles, pre-kindergarten and kindergarteners participating in another plate waste study also wasted significantly more vegetables than fruit.[12,13] However, it is important to note that this study was conducted only months after the new requirements were mandated. Strategies that work to increase fruit and vegetable consumption in middle and high school students may not work for elementary-aged children, because younger children tend to waste more food.[42]

Prior to the implementation of *Cooking for Kids*, a baseline meal component (entrée, grain, vegetable and fruit) study was conducted with the purpose of determining students' consumption patterns in the pilot schools across the state of Oklahoma. For the baseline study, a total of 1524 before and after meal observations were matched using the quarter-waste method described previously.[43] The mean amount consumed was calculated for each meal component. Entrees were consumed the most at a mean of 0.65, and consumption of grain (0.56), vegetable (0.45) and fruit (0.41) followed behind. Consumption of each meal component was measured to the nearest quarter. About half (55.2%) of all students consumed all of the main entrées, while

only 44% consumed the complete serving of grain. Only 7.8% and 28.5% of students did not consume any of their main entrée and grain, respectively. The baseline study found that few students consumed all of their fruit (28.7%) and vegetable (24.9%) meal components. Additionally, higher percentages of students did not consume any of their fruit (45.6%) or vegetable (30.9%) meal components.

The methods and limitations reported from the various plate waste studies contributed to the design of the *Cooking for Kids* consumption study. Further, the *Cooking for Kids* baseline study was critical for being able to evaluate the impact of the program on students' consumption of the revised menus and recipes.

Oklahoma's Efforts to Change the Lunchroom

The evidence-based best practices mentioned throughout the literature review are emerging in Oklahoma schools. According to the Oklahoma School Health Profiles in 2014, 57% of Oklahoma middle and high schools have moved fruits and vegetables to a more convenient location.[5] Of these schools, 60% have introduced a salad bar in the hopes of increasing vegetable consumption. In terms of food pricing, 13% of schools chose to price the healthier options lower than the foods with less nutritional value. These are examples of *Smarter Lunchroom* strategies used in lunchrooms to encourage students' selection of healthy foods. However, evaluation of these efforts has not been conducted.

Cooking for Kids, created under the partnership of Oklahoma State University Department of Nutritional Sciences and the Oklahoma State Department of Education, is a nutrition and culinary training program for school nutrition professionals developed using evidence-based best practices and barriers to implementation of updated school meal standards reported in the literature.[11,15,21,29,31-32,34-35,37-41] The program utilizes professionally trained chefs to teach culinary skills that are essential for meeting the new national meal standards and creating meals that appeal to students.[11,40] The industry-experienced chefs were trained by *Cooking for Kids* partners to use the evidence-based curriculum to train the school nutrition professionals. A

baseline meal consumption study, using the quarter-waste method, was conducted to determine students' consumption patterns of school meal components.[43] This information, coupled with the readiness assessment, informed development of the program.[34] The program has two components. The first is skill development training offered regionally across Oklahoma during the summer months. It targets cafeteria managers, head cooks and cooks. The sessions are taught by professionally trained chefs using curriculum designed to address barriers reported by school nutrition professionals in meeting the 2012 meal patterns and nutrition standards. These barriers, as mentioned previously, include time management, food preparation skills and flavor building, and students' acceptance of meals. Objectives for the skill development training are provided in Appendix E. The second component places chefs in school districts who have participated in the regional skill development training. The aim is for chefs to work with school nutrition directors to address unique needs of the district related to menu planning and recipe modifications to decrease processed foods, procurement, personnel management, and implementing *Smarter Lunchrooms* strategies. The chef consult protocol includes working with the school nutrition director to conduct a needs assessment, development of an action plan, and implementation.

CHAPTER III

METHODOLOGY

The schools involved in this study were all located in the state of Oklahoma and were selected based on recommendation by the Oklahoma State Department of Education. The schools received skill development training and worked with a consulting chef in school year 2015-2016. The *Cooking for Kids* project is funded by the Oklahoma State Department of Education in Child Nutrition Services through USDA Food and Nutrition Services. This study was approved by the Oklahoma State University Institutional Review Board (Appendix I).

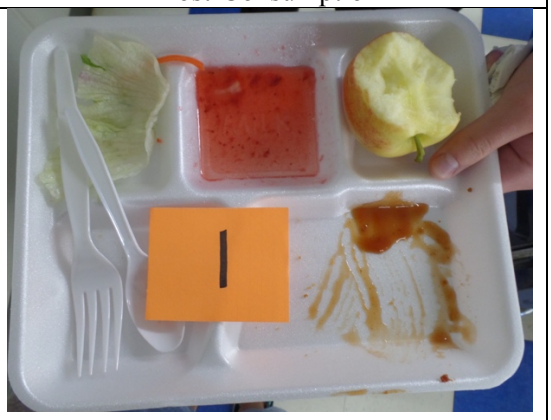
Meal Component Consumption Analysis

In order to evaluate consumption and compare to the baseline study, a combination of the photograph and quarter-waste method mentioned earlier, developed by Hanks, Wansink and Just, was used to measure students' consumption of the entrée, grain, vegetable and fruit meal components.[41] Also, the methods used in this study correspond with those used in the baseline study conducted by Carl.[43] The post-consumption study took place at each school for two nonconsecutive days in September of 2016. The goal was to collect matched trays for 30% of the school enrollment. The number of matched trays varied depending on the site, for each school had different enrollment numbers. The child was not photographed in order to keep their identity hidden; only the tray was photographed. Colored index cards were used to differentiate between

schools and on which day of the week the photos were taken. The colored cards were numbered using a 100-series for Day 1 and a 1,000-series for Day 2 at the schools.

As each student exited the lunch serving line they were asked if a photograph could be taken of their tray and, if they gave verbal consent, a numbered card was placed on their tray and a digital photograph was taken. The researchers made sure that the number placed on each tray was visible in the photographs for comparison purposes. While taking the first photograph, the students were informed that a second photograph would be taken before disposing of their tray. After students completed their lunch period, another photo was taken of their tray to measure consumption. To take the second photo, the research assistants either met the child at the trashcans before they disposed of their unconsumed food or the child left their tray on a table as they were leaving the cafeteria. Figure 1 is an example of a pair of matched tray photos taken at a school.

Figure 1: Example photographs of a pair of matched trays

Pre-Consumption	Post-Consumption
	

Data Analysis

Consumption was measured by recording how much of each meal component (e.g., main entrée, grain, fruit and vegetable) was consumed to the nearest 1/4th. Milk consumption was not measured because it was not a part of the intervention. Pre- and post-meal consumption photos were matched by number identification for comparison. To determine how much of each meal

component was consumed, two researchers compared pre- and post-meal consumption photographs where 0.00 equaled none of the component consumed, 0.25, 0.50, 0.75, and 1.0 equaled all of the meal component consumed.[41] Depending on the menu for the day at the school, the grain component may or may not have been incorporated into the entrée (e.g. noodles for chicken tetrazzini, breaded meat or sandwich buns). For these entrees in particular, the grain component was not counted separately; it was counted as part of the entree. It is possible that some children removed the identification cards, which lowered the number used for analysis. Only meal component consumption was measured, as opposed to measuring the nutrient value of the foods.

Inter-rater reliability was assessed for the two researchers comparing the pre- and post-meal consumption trays. For each day at each school, fifteen randomly selected trays were evaluated to increase reliability. Collectively, 90 pairs (pre- and post-meal consumption) of matched trays were analyzed. The researchers achieved a very good agreement based on the Cohen's kappa score (0.816; $p \leq 0.001$).[44] After establishing reliability, each researcher analyzed an additional 223 and 224 matched trays and determined how much was consumed of each of the four meal components.

Meal Preparation & Smarter Lunchrooms Analysis

Researchers conducted personal interviews with the Child Nutrition Directors to discuss menus, preparation techniques and use of *Smarter Lunchroom* strategies. The interviews were conducted during the same time period (Fall 2016) as the post-consumption study. For all schools, the Child Nutrition Director did not change from pre- to post- intervention.

To determine change in the amount of scratch-prepared meals, a 1-month menu from September 2015 (pre-intervention) was compared to a 1-month menu from September 2016 (post-intervention) for each school. In order to determine the level of food preparation, the Child Nutrition Director for each school was asked to classify each entrée(s) on each day of the 1-month menus based on the following definitions adapted from a study by Woodward-Lopez et

al.[45]

Convenience means the foods are fully processed and only require heating and serving. Examples include heat-n-serve macaroni and cheese and premade bean and cheese burrito.

Minimal preparation means assembly of ingredients that are highly processed. Examples include premade meatloaf with rehydrated mashed potatoes and chilidogs made with buns, hot dogs and canned beans and tomatoes for chili.

Almost scratch means some of the ingredients are raw and some mixing, cooking and preparation is involved. An example is chicken teriyaki made with precooked and sauced chicken strips, fresh rice and fresh vegetables.

Made from scratch means the ingredients are raw or close-to-raw, including unseasoned, pre-cooked meat. An example is chicken fajitas made with chicken strips, grilled, tortillas and fresh vegetables.

After classifying the entrees, totals for each of the four categories above were divided by the total number of entrees prepared that month to get a percentage. This information was organized using a table for each menu (September 2015 & September 2016) found in Appendix F.

At post-intervention, a cross-sectional description illustrates if and to what extent each school practiced *Smarter Lunchroom* strategies. This information was gathered through a discussion with the Child Nutrition Director at each school. The evaluation matrix used was adapted from one developed by the *Smarter Lunchrooms Movement*.[46] The strategies were described based on five categories: fruit, vegetable, variety, entrée and reimbursable meals. Within each category, there are 6 action levels, with 1 being the least challenging to implement and persuasive in influencing students' choices and 6 being the most influential strategy. The implementation of these strategies increase in intensity throughout the different levels based on a few overarching categories such as convenience, appeal, variety, and verbal prompts from the

child nutrition professional. The specifics of these strategies are presented in the *Smarter Lunchrooms* Action Level table provided in Appendix G. This table was used as a guide for the Child Nutrition Director to determine the level they have achieved for each of the five categories within their school.

Statistical Analyses

The Statistical Package for Social Sciences (SPSS) software version 20.0 (Chicago, IL) was used to analyze all data for this study with the statistical significance set at $p < 0.05$.[47] To compare change scores from the *Cooking for Kids* baseline food consumption study with this study, One-way ANOVA was used with school and time as the variables.

Due to a small sample of schools, the change in the amount of scratch-prepared meals and the implementation of *Smarter Lunchroom* practices at post-intervention were discussed and analyzed using descriptive statistics based on the personal interview findings using the tables in Appendix F and G. Additionally, the *Smarter Lunchrooms* Action Levels evaluation table was used to determine how well the schools have accepted and implemented the *Smarter Lunchroom* strategies emphasized in *Cooking for Kids*. The percentages calculated for the extent of scratch cooking for pre-menu and post-menu were used to determine change within each school after the chef intervention.

CHAPTER IV

FINDINGS

Three of the *Cooking for Kids* pilot schools participated in the post-intervention meal consumption study, including two secondary schools and one elementary school. Enrollment at the three schools range from 56 to 685 students. Two schools receive meals prepped from a satellite location for all schools in the district and one school prepared meals at an on-site kitchen. Two of the schools have over 60% of students that qualify for free or reduced price lunches. Table 2 provides detailed demographic information for each of the three pilot schools.

Table 2: Demographics of Pilot Schools (2015-2016)[30]

	Pilot School 1	**Pilot School 2**	**Pilot School 3**
Grade Level	Secondary (10-12)	Elementary (Pre-K- 5)	Secondary (9-12)
Kitchen Operation System	Central/Satellite	Central/Satellite	On-Site
Enrollment	685	308	56
% Free Meal Eligibility	26.57%	54.87%	44.64%
% Reduced Meal Eligibility	6.72%	6.82%	19.64%
# of Free & Reduced	228	190	36
% Low Income	33.28%	61.69%	64.29%

Meal Component Consumption Analysis

Two of the schools participated in the offer versus serve option and therefore, not all meals contained each of the four meal components analyzed and for some meals, the grain component was incorporated into the entrée component. The different menu items served at each pilot school at baseline and post-intervention are listed in Appendix H.

As summarized in Table 3, a total of 681 and 537 matched trays at baseline (2014) and post-intervention (2016), respectively, for the three pilot schools. Across schools, there were significant increases in two of the four measured meal components. For the grain component, mean consumption increased from approximately one-half of the item to two-thirds. Similarly, there was a significant increase in the mean consumption of the fruit meal component from approximately one-half of the item at baseline to two-thirds at post-intervention. While there was no change in students' mean entrée consumption; they were consuming approximately 75% of the item at both baseline and post-intervention. The vegetable meal component was the only component where there was a significant decrease in mean consumption from baseline to post-intervention. In summary, at post intervention students were consuming approximately three-fourths of the entrée, two-thirds of the grain component, two-thirds of the fruit component and slightly less than one-half of the vegetable.

There were some varying differences in consumption patterns seen at each school between baseline and post-intervention. At School 1, there were a total of 209 and 177 matched trays at baseline and post-intervention, respectively. There was no significant difference in the mean entrée meal component from baseline to post-intervention. At this school, the grain was incorporated in the entrée (e.g. chicken and noodles). Additionally, there was a significant decrease in the mean vegetable meal component from baseline to post-intervention. Inconsistent with School 2, there was a significant increase in mean fruit meal component from baseline to post-intervention.

At School 2, there were a total of 356 and 237 matched trays at baseline and post-intervention, respectively. Comparing means for the entrée meal component, there was a not a significant difference in consumption from baseline to post-intervention. There was a significant increase in mean grain component consumption from baseline to post-intervention. In contrast, there was a significant decrease for both the mean vegetable and mean fruit component from baseline to post-intervention.

At School 3, there were a total of 116 and 123 matched trays at baseline and post-intervention, respectively. There was a significant decrease in mean entrée meal component consumption from baseline to post-intervention. Because the grain component was integrated into the entrée for both days in 2014, one-way ANOVA was not conducted for the grain component. In 2016, only one of the days had the grain component incorporated into the entrée choice (e.g. tortilla chips in taco soup). One the other day, students consumed about ¾ of the grain component, which was separate from the entrée. The mean vegetable meal component, there was no significant difference seen from baseline to post-intervention. However, there was a significant increase seen in the mean fruit meal component from baseline to post-intervention.

Table 3: Comparison of Mean Meal Component Consumption at Baseline (2014) and Post-Intervention (2016)

Pilot School			Entrée *Mean*[a] ± *SD* *N*[b]	Grain *Mean*[a] ± *SD* *N*[b]	Vegetable *Mean*[a] ± *SD* *N*[b]	Fruit *Mean*[a] ± *SD* *N*[b]
School 1	**Year**	**2014**	0.88 ± 0.21 209	- -	0.84 ± 0.28 208	0.37 ± 0.45 165
		2016	0.86 ± 0.27 177	- -	0.61 ± 0.39 88	0.89 ± 0.26 132
	***p*-value**		0.352	-	≤ 0.00 [c]	≤ 0.00 [c]
School 2	**Year**	**2014**	0.64 ± 0.38 356	0.54 ± 0.43 184	0.30 ± 0.31 356	0.49 ± 0.44 356
		2016	0.65 ± 0.36 237	0.65 ± 0.44 113	0.16 ± 0.32 237	0.39 ± 0.43 237
	***p*-value**		0.816	0.031[c]	≤ 0.00 [c]	0.007 [c]
School 3	**Year**	**2014**	0.89 ± 0.23 116	- -	0.73 ± 0.33 95	0.66 ± 0.41 102
		2016	0.80 ± 0.31 123	0.79 ± 0.31[d] 14	0.75 ± 0.31 112	0.78 ± 0.33 119
	***p*-value**		0.025 [c]	-	0.632	0.028 [c]
ALL SCHOOLS	**Year**	**2014**	0.76 ± 0.33 681	0.54 ± 0.43 184	0.53 ± 0.40 659	0.49 ± 0.45 623
		2016	0.76 ± 0.34 537	0.66 ± 0.43 127	0.40± 0.43 437	0.62 ± 0.43 488
	***p*-value**		0.878	0.011[c]	≤ 0.00 [c]	≤ 0.00 [c]

[a] Mean ± Standard Deviation
[b] N = number of matched meal observations
[c] Statistical significance set at $p < 0.05$
[d] One-way ANOVA not conducted because grain was integrated into the entrée on all days in 2014

Food Preparation Methods

Table 4 summarizes the level of food preparation observed for each school from baseline to post-intervention. For all schools, the amount of convenience prepared entrées decreased by 10.5% from baseline to post-intervention. This difference seems to have shifted to more minimally prepared entrées, with an increase of 9.6% from baseline to post-intervention. There was no difference seen in the percentage of entrées made almost from scratch. From baseline to post-intervention, there was a slight (1%) increase in the percentage of entrees prepared from scratch. Overall, the most change was seen in the amount of minimal preparation.

Table 4: Change in the Extent to Which Scratch Cooking Methods Were Used at Baseline and Post-Intervention

	School 1		School 2		School 3		ALL Schools		
	Sept. 2015	Sept. 2016	Sept. 2015	Sept. 2016	Sept. 2015	Sept. 2016	Sept. 2015	Sept. 2016	% change
Convenience (%)	90.2	78.6	57.9	45	23.8	15	65.4	54.9	- 10.5
Minimal Preparation (%)	9.8	19	5.3	15	19.0	30	11.1	20.5	+ 9.6
Almost Scratch (%)	0	0	10.5	5	0	5	2.5	2.5	0.0
Made from Scratch (%)	0	2.4	26.3	35	57.1	50	21.0	22.0	+ 1.0

Smarter Lunchroom Strategies

Table 5 presents the mean *Smarter Lunchroom* Action Level scores for all schools. As mentioned previously, there were five different categories represented on the *Smarter Lunchrooms* Action Levels evaluation tool (Appendix G): fruit, vegetable, variety, entrée, and reimbursable meals. As the strategy level number increases the more influential or persuasive the marketing strategy.

The mean action level score at post-intervention for fruit was 3.0. This score reflects that the fruit offered was easily accessible to students because it was either in an attractive bowl or portioned in clear cups on the lunch line.

The mean action level score for vegetables was 2.0. This score indicates that the vegetables offered were in a highly visible location on the lunch line, yet they were not labeled with creative, age-appropriate names or displayed on a menu board near the lunch line.

The mean action level score for variety was 4.0. On average, schools offered at least two or more fruits and two or more vegetables each day to increase variety. In addition, the fruits and

vegetables were easily accessible for students and they could select as much as they wanted. In general, competitive snack foods were in a convenient location, typically near the register.

The mean action level score for entrée was 1.3. This score indicates that schools typically offered only one entrée choice and the meal was not labeled with a creative name and not usually made from scratch.

The mean action score for reimbursable meals was 1.7. On average, schools offered the reimbursable meal in at least two lunch lines, but the reimbursable meal was not publically labeled and did not have at least two different meal combinations.

Table 5: Mean *Smarter Lunchrooms* Action Levels at Post-intervention (2016)

	School 1	School 2	School 3	Mean Score
Fruit	4	1	4	3.0
Vegetable	2	2	2	2.0
Variety	5	1	6	4.0
Entrée	2	1	1	1.3
Reimbursable Meals	3	1	1	1.7

CHAPTER V

DISCUSSION & CONCLUSIONS

The purpose of this study was to evaluate the efficacy of the *Cooking for Kids* culinary chef consult phase to increase the number of entrees using fewer processed or convenience foods and the impact it had on students' consumption of meal components (entrée, grain, fruit and vegetable). The study also included a cross-sectional analysis of the extent to which schools were using the *Smarter Lunchroom* marketing strategies at post-intervention to encourage the consumption of healthier options in the school cafeteria.

Meal Component Consumption

After conducting a recent survey of School Food Authorities Directors, the Pew Charitable Trusts' recommended that in order to meet the new meal standards and promote healthy eating, schools would need to decrease the use of convenience foods.[48] The aim of *Cooking for Kids* was consistent with this recommendation.[48] The findings reflected that there was a decrease in the use of foods that were fully processed and an increase in the use of minimal preparation techniques that required the assembly of processed ingredients. This reflected a small change toward the Pew Charitable Trusts' recommendation.[48] More importantly, this change did not negatively impact students' consumption of the entrée in that at both time periods students were consuming approximately three-fourths of the meal component. While it was hypothesized that the intervention would increase student consumption of the entrée, the finding reflected no

negative impact. Overall, the entrée consumption in this study was similar to the mean entrée consumption reported by Schwartz et al. after the implementation of the new USDA meal standards.[11] The amount of entrée consumed in this study was also comparable to a school meal component study conducted by Cohen et al. (2014) in which 88% of the entrée was consumed post- intervention.[49] Even though the pre-intervention entrée consumption mean was relatively high in this study, the *Smarter Lunchrooms* action level for entrée marketing (1.3) reflects the schools were not consistently offering students a choice of entrées. By offering more entrée choices to students, consumption has potential to increase. In addition, offering entrée choices made from scratch may be more appealing to students than convenience foods.

This study recorded an increase in students' consumption of whole grain-rich meal components. This increase reflects findings from a study reporting students' preference for whole grain-rich, compared to refined grain, food items in the school meal program.[50] A study by Cohen et al. suggested that middle school students enjoyed whole grain foods as reflected by their consumption of one and a half servings of whole grain in both chef initiative schools and control schools.[40] On some data collection days for this study, the grain component was incorporated into the entrées that were well-liked by students (i.e., chicken tetrazzini, tacos, chicken sandwiches). Across all schools, even when the grain component was incorporated into the entrée, students still consumed more than ¾ of the entrée. Therefore, the students were consuming about ¾ of the grain component on those days as well.

Students' fruit consumption increased and may be a result of the use of *Smarter Lunchroom* practices. Across all schools, the mean *Smarter Lunchroom* score was 3.0, indicating schools were presenting the fruit in an attractive and convenient manner. This mean score was driven by the two secondary schools which both had a *Smarter Lunchrooms* score of 4.0. It is important to note that the elementary school (School 2) using a satellite kitchen did have a significant decrease in fruit consumption post-intervention. The *Smarter Lunchroom* score for fruit at School 2 was 1, indicating the fruit was presented in a less than appealing way. Of note,

the elementary school served canned fruits on all data collection days, baseline and post-intervention. Unlike the elementary school, both secondary schools displayed fruit attractively on the salad bars with at least two fresh fruit options each day. Students could take as much fruit as they wanted.

This *Cooking for Kids* intervention seemed to be more effective at increasing fruit consumption compared to the chef initiative conducted in Boston middle schools.[40] This comparison is important to note because the purposes of the chef initiative are similar to those of *Cooking for Kids*. Although the chef intervention in the New York schools did not have an effect on fruit consumption, the mean fruit consumption (87%) was higher than the mean fruit consumption (62%) in this study.[39] Overall, the fruit consumption in this study was comparable to the mean fruit consumption reported by Schwartz et al. after the implementation of the new USDA meal standards.[11] While this finding reflects that the fruit consumption after this intervention was not as high, there was still a significant increase from pre-intervention fruit consumption.[11] This is important considering Oklahoma ranks last on the list compared to other states in terms of fruit consumption.[6]

In contrast to the increase in fruit consumption in this study, there was an unexpected decrease in the amount of vegetable consumed. Students were consuming just less than ½ of the vegetable component which is similar to the amount middle school students consumed in a chef intervention study conducted by Cohen et al. in 2013.[51] It is also consistent with a second study conducted by the research group in 2014.[49] A possible explanation for the observed decrease may be due to a change in the variety of vegetables offered to students in 2016 (i.e. less potatoes, more red/orange and dark green vegetables). In the baseline study, vegetables, in general, were more preferred than fruit. At that time, the vegetables served consisted of mainly potatoes and beans.[43] In a questionnaire of Indiana school foodservice managers/directors, it was reported that vegetables, by far, were the most wasted meal component after the implementation of the new NSLP meal regulations.[52] Some of the vegetable consumption trends may be attributed to *Smarter*

Lunchroom vegetable strategies and the presence, or lack of, a salad bar at the schools. Across all schools, the mean *Smarter Lunchrooms* action level for vegetables was 2.0 which suggests vegetables were only in a highly visible location on the lunch line. Further, the elementary school did not offer students a choice of vegetable, as reflected by the *Smarter Lunchrooms* score of 1 under variety. It is especially important to find creative ways to increase vegetable consumption in elementary schools because younger children are known to waste more food than older students.[42] Allowing younger children to choose their fruit and vegetables at a self-service line may increase consumption.[42] Both secondary schools, Schools 1 and 3, have full salad bars available to students each day. All the vegetables on the salad bars were presented in an attractive way and students could take as much as they wanted, as reflected by the *Smarter Lunchrooms* score of 5 and 6 under variety. Simply offering a wide variety of new vegetable options may not be enough to increase consumption. Students may need to be introduced to vegetables through taste-testing before offering them on the lunch line.

The pilot schools reduced the amount of convenience entrees; however, the schools with central/satellite kitchens (Schools 1 and 2) served a larger percentage of convenience entrees post-intervention compared to the onsite kitchen (School 3). This finding suggests more work is needed to overcome some of the infrastructure and equipment needs faced with a central/satellite kitchen operations. These barriers were mentioned in the readiness assessment conducted with Oklahoma school nutrition professionals and also faced by other school districts across the United States.[31,34]

While this study does not directly measure participation, preparing more foods from scratch may help increase student participation and thus, consumption of school meals.[48] Lower NSLP participation has been a barrier to implementing the new meal standards and may reflect a lack of student acceptance of school meals.[10] Updated Oklahoma NSLP participation data for FY 2016 showed a continued increase to 446,449 students, which was the highest it had been since FY 2011. FY 2012 participation was just below FY 2016 at 446,144 students.[10] While Oklahoma

NSLP participation increased, the national total participation slightly decreased from 30,490,536 students in FY 2015 to 30,386,818 students in FY 2016.[10] This increase in Oklahoma could be attributed to many factors. For example, it could be that students are being exposed to more foods that appeal to them. It could also be that more families are relying on school meals to feed their children because of financial burdens. This is evident by the Oklahoma unemployment rate, an indicator of economic activity, which has gradually increased since 2015.[53] Additionally, the Oklahoma poverty percentage is about 2.5 percent higher than the national poverty percentage.[54]

In summary, a study by Cohen et al. (2015) suggests that using choice architecture does have the potential to improve consumption, yet it is still important to improve palatability alongside these strategies.[14] A multi-component intervention may be more efficacious in sustaining changes. *Cooking for Kids* is a multi-component intervention that incorporates professional chefs and *Smarter Lunchroom* practices with the aim of decreasing use of convenience food and increasing students' consumption of school meals. In this study, the pilot schools minimized the use of convenience foods which did not negatively impact consumption of the entrée meal component. Additionally, schools increased grain and fruit consumption. Students' decreased vegetable consumption may have been reflective of schools' limited use of *Smarter Lunchroom* strategies. As schools move toward preparing more meals from scratch and utilize *Smarter Lunchroom* strategies to a greater extent, students' consumption of school meals may continue to increase. Table 6 presents the interpreted null hypotheses based on post-intervention findings.

Table 6: Interpretation of Null Hypotheses at Post-Intervention	
Null Hypotheses	**Rejected or Failed to Reject**
1. After implementation of *Cooking for Kids*, there will be no change in students' consumption of the entrée meal component.	Failed to reject
2. After implementation of *Cooking for Kids*, there will be no change in students' consumption of the grain meal component.	Rejected
3. After implementation of *Cooking for Kids*, there will be no change in students' consumption of the vegetable meal component.	Rejected
4. After implementation of *Cooking for Kids*, there will be no change in students' consumption of the fruit meal component.	Rejected

Limitations

This study compared the pilot schools that participated in *Cooking for Kids* at pre- and post-intervention. A limitation of this study was that the pilot schools were not compared to control schools without the intervention. By adding this component to the study, it would further increase the likelihood that the findings were a result of *Cooking for Kids*. This is a direction for future research.

There were six pilot schools that participated in the baseline study.[49] However, due to management changes and lack of readiness to make change, three of the schools did not participate in the post-intervention study. If data would have been collected from six schools at post-intervention, the findings may have been different.

This study was conducted on two nonconsecutive days at each school. Ideally, in order to evaluate the consumption of a wider variety of options, visiting each pilot school more than two days may have better depicted consumption patterns. However, the number of days each school was visited in this study was the same as other previously conducted meal consumption studies.[40,51] However, this study was different in that the days were nonconsecutive. Other consumption studies have gathered data for up to five consecutive days.[12,13] By attending the

school two days, it minimized the inconvenience for the pilot schools and child nutrition professionals. The goal was to disturb the normal lunch time flow as little as possible.

Students were aware of the research assistants' presence in the cafeteria; however, replies to inquiries about the purpose of the study were vague to avoid disruption of normal consumption patterns. Students may have made assumptions of the purpose of study because their trays were being photographed. When students asked about the purpose of photographs, it was briefly explained that the research assistants were there to look at food trends and see how much students liked the meals.

While the pilot schools were not randomly selected, consideration was given to the grade level served, geographic location within the state, and the type of food operation system. They were chosen by the Oklahoma Department of Education to participate in the *Cooking for Kids* pilot program. Therefore, the pilot schools were essentially required to participate as oppose to volunteering and so, they may not be representative of all schools.

Implications for Practice & Future Research

While students participating in this study did consume most of the entrées in which the grain component was incorporated, it is not known if this consumption pattern was reflective of students across the nation after the implementation of the new NSLP meal standards because research is still lacking in this area. More research is needed to evaluate students' consumption of whole grain-rich and whole grain meal components apart from the entrée.

Schools should focus on approaches to increase vegetable consumption by offering vegetables that are fresh or cooked and seasoned in a way that appeals to students. This may involve more taste testing. According to a survey report by the Pew Charitable Trusts', 38% of School Food Authorities found, of all plate-waste minimizing strategies, taste testing was extremely or moderately effective.[48]

Further work is needed to identify strategies to limit convenience entrées and increase fresh fruit and vegetable variety in elementary schools, especially those using central/satellite

kitchen operations. On both national and local levels, more policy development is needed to improve kitchen infrastructure for both onsite and central/satellite kitchen operations in schools across the nation. Policy development is consistent with the Pew Charitable Trusts' recommendation that funds for kitchen equipment and infrastructure should be a priority in order to serve tasty and healthy meals.[31]

Parallel with the Pew Charitable Trusts' recommendations for increasing participation and revenue, future culinary training efforts should identify ways for child nutrition professionals to collaborate with each other to share techniques to prepare meals from scratch, recipes and ways to involve school nutrition stakeholders.[48] Considering the Pew Charitable Trusts' recommendation, further work is needed to determine if a chef intervention with a marketing component changes students' perceptions of and participation in the school meal program.[48] More research is needed to allow for a comparison between schools that utilize chefs and marketing strategies and schools that do not.

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APPENDICES

Appendix A: Comparisons of NSLP previous meal standards and new meal standards [26]

Comparison of Previous and Current Regulatory Requirements under Final Rule "*Nutrition Standards in the National School Lunch and School Breakfast Programs*" (published January 26, 2012)

National School Lunch Program Meal Pattern		
Food Group	**Previous Requirements K-12**	**Current Requirements K-12 (as of 7/1/12)**
Fruit and Vegetables	½ - ¾ cup of fruit and vegetables combined per day	¾ - 1 cup of vegetables plus ½ -1 cup of fruit per day Note: Students are allowed to select ½ cup fruit or vegetable under OVS.
Vegetables	No specifications as to type of vegetable subgroup	Weekly requirement for: • dark green • red/orange • beans/peas (legumes) • starchy • other (as defined in 2010 Dietary Guidelines)
Meat/Meat Alternate (M/MA)	1.5 – 2 oz eq. (daily minimum)	Daily minimum and weekly ranges: Grades K-5: 1 oz eq. min. daily (8-10 oz weekly) Grades 6-8 : 1 oz eq. min. daily (9-10 oz weekly) Grades 9-12 : 2 oz eq. min. daily (10-12 oz weekly)
Grains	8 servings per week (minimum of 1 serving per day)	Daily minimum and weekly ranges: Grades K-5: 1 oz eq. min. daily (8-9 oz weekly) Grades 6-8 : 1 oz eq. min. daily (8-10 oz weekly) Grades 9-12 : 2 oz eq. min. daily (10-12 oz weekly)
Whole Grains	Encouraged	At least half of the grains must be whole grain-rich beginning July 1, 2012. Beginning July 1, 2014, all grains must be whole grain rich.
Milk	1 cup Variety of fat contents allowed; flavor not restricted	1 cup Must be fat-free(unflavored/flavored) or 1% low fat (unflavored)

Appendix B: Comparisons of SBP previous meal standards and new meal standards [26]

Comparison of Previous and Current Regulatory Requirements under Final Rule "*Nutrition Standards in the National School Lunch and School Breakfast Programs*" (published January 26, 2012)

School Breakfast Program Meal Pattern		
Food Group	**Previous Requirements K-12**	**Current Requirements K-12** (as of 7/1/12)
Fruit	½ cup per day (vegetable substitution allowed)	1 cup per day (vegetable substitution allowed) Note: Quantity required SY 2014-15. Students are allowed to select ½ cup of fruit under OVS.
Grains and Meat/Meat Alternate (M/MA)	2 grains, or 2 meat/meat alternates, or 1 of each per day	Daily min. and weekly ranges for grains: Grades K-5: 1 oz eq. min. daily (7-10 oz weekly) Grades 6-8 : 1 oz eq. min. daily (8-10 oz weekly) Grades 9-12 : 1 oz eq. min. daily (9-10 oz weekly) Note: Quantity required SY 2013-14. Schools may substitute M/MA for grains after the minimum daily grains requirement is met.
Whole Grains	Encouraged	At least half of the grains must be whole grain-rich beginning July 1, 2013. Beginning July 1, 2014, all grains must be whole grain rich.
Milk	1 cup Variety of fat contents allowed; flavor not restricted	1 cup Must be fat-free (unflavored/flavored) or 1% low fat (unflavored)

Appendix C: Comparisons of NSLP/SBP previous meal standards and new meal standards [26]

Comparison of Previous and Current Regulatory Requirements under Final Rule "*Nutrition Standards in the National School Lunch and School Breakfast Programs*" (published January 26, 2012)

Previous Nutrient Standards	Current Standards K-12 (as of 7/1/12)		
Sodium Reduce, no set targets	**Target I: SY 2014-15** Lunch ≤1230mg (K-5); ≤1360mg (6-8); ≤1420mg (9-12) Breakfast ≤540mg (K-5); ≤600mg (6-8); ≤640mg (9-12	**Target 2: SY 2017-18** Lunch ≤935mg (K-5) ≤1035mg (6-8); ≤1080mg (9-12) Breakfast ≤485mg (K-5); ≤535mg (6-8); ≤570mg (9-12	**Final target: 2022-23** Lunch ≤640mg (K-5); ≤710mg (6-8); ≤740mg (9-12) Breakfast ≤430mg (K-5); ≤470mg (6-8); ≤500mg (9-12)
Calories (min. only) *Traditional Menu Planning* Lunch: 633 (grades K-3) 785 (grades 4-12) 825 (optional grades 7-12) Breakfast: 554 (grades K-12) *Enhanced Menu Planning* Lunch: 664 (grades K-6) 825 (grades 7-12) 633 (optional grades K-3) Breakfast: 554 (grades K-12) 774 (optional grades 7-12) *Nutrient Based Menu Planning* Lunch: 664 (grades K-6) 825 (grades 7-12) 633 (optional grades K-3) Breakfast: 554 (grades K-12) 618 (optional grades 7-12)	**Calorie Ranges (min. & max.)** *Only food-based menu planning allowed* Lunch: 550-650 (grades K-5) 600-700 (grades 6-8) 750-850 (grades 9-12) Breakfast: 350-500 (grades K-5) 400-550 (grades 6-8) 450-600 (grades 9-12)		
Saturated Fat <10% of total calories	**Saturated Fat** <10% of total calories		
Trans Fat: no limit	**New specification**: zero grams per serving (nutrition label)		

Appendix D: NSLP new meal pattern requirements [27]

Final Rule Nutrition Standards in the National School Lunch and School Breakfast Programs – Jan. 2012

	Breakfast Meal Pattern			Lunch Meal Pattern		
	Grades K-5[a]	*Grades 6-8*[a]	*Grades 9-12*[a]	*Grades K-5*	*Grades 6-8*	*Grades 9-12*
Meal Pattern	**Amount of Food[b] Per Week (Minimum Per Day)**					
Fruits (cups)[c,d]	5 (1) [e]	5 (1) [e]	5 (1) [e]	2½ (½)	2½ (½)	5 (1)
Vegetables (cups)[c,d]	0	0	0	3¾ (¾)	3¾ (¾)	5 (1)
Dark green[f]	0	0	0	½	½	½
Red/Orange[f]	0	0	0	¾	¾	1¼
Beans/Peas (Legumes)[f]	0	0	0	½	½	½
Starchy[f]	0	0	0	½	½	½
Other[f,g]	0	0	0	½	½	¾
Additional Veg to Reach Total[h]	0	0	0	1	1	1½
Grains (oz eq)[i]	7-10 (1)[j]	8-10 (1)[j]	9-10 (1)[j]	8-9 (1)	8-10 (1)	10-12 (2)
Meats/Meat Alternates (oz eq)	0[k]	0[k]	0[k]	8-10 (1)	9-10 (1)	10-12 (2)
Fluid milk (cups)[l]	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)
Other Specifications: Daily Amount Based on the Average for a 5-Day Week						
Min-max calories (kcal)[m,n,o]	350-500	400-550	450-600	550-650	600-700	750-850
Saturated fat (% of total calories)[n,o]	< 10	< 10	< 10	< 10	< 10	< 10
Sodium (mg)[n, p]	≤ 430	≤ 470	≤ 500	≤ 640	≤ 710	≤ 740
Trans fat[n,o]	Nutrition label or manufacturer specifications must indicate zero grams of trans fat per serving.					

[a] In the SBP, the above age-grade groups are required beginning July 1, 2013 (SY 2013-14). In SY 2012-2013 only, schools may continue to use the meal pattern for grades K-12 (see § 220.23).
[b] Food items included in each food group and subgroup and amount equivalents. Minimum creditable serving is ⅛ cup.
[c] One quarter-cup of dried fruit counts as ½ cup of fruit; 1 cup of leafy greens counts as ½ cup of vegetables. No more than half of the fruit or vegetable offerings may be in the form of juice. All juice must be 100% full-strength.
[d] For breakfast, vegetables may be substituted for fruits, but the first two cups per week of any such substitution must be from the dark green, red/orange, beans and peas (legumes) or "Other vegetables" subgroups as defined in §210.10(c)(2)(iii).
[e] The fruit quantity requirement for the SBP (5 cups/week and a minimum of 1 cup/day) is effective July 1, 2014 (SY 2014-2015).
[f] Larger amounts of these vegetables may be served.
[g] This category consists of "Other vegetables" as defined in §210.10(c)(2)(iii)(E). For the purposes of the NSLP, "Other vegetables" requirement may be met with any additional amounts from the dark green, red/orange, and beans/peas (legumes) vegetable subgroups as defined in §210.10(c)(2)(iii).
[h] Any vegetable subgroup may be offered to meet the total weekly vegetable requirement.
[i] At least half of the grains offered must be whole grain-rich in the NSLP beginning July 1, 2012 (SY 2012-2013), and in the SBP beginning July 1, 2013 (SY 2013-2014). All grains must be whole grain-rich in both the NSLP and the SBP beginning July 1, 2014 (SY 2014-15).
[j] In the SBP, the grain ranges must be offered beginning July 1, 2013 (SY 2013-2014).
[k] There is no separate meat/meat alternate component in the SBP. Beginning July 1, 2013 (SY 2013-2014), schools may substitute 1 oz. eq. of meat/meat alternate for 1 oz. eq. of grains after the minimum daily grains requirement is met.
[l] Fluid milk must be low-fat (1 percent milk fat or less, unflavored) or fat-free (unflavored or flavored).
[m] The average daily amount of calories for a 5-day school week must be within the range (at least the minimum and no more than the maximum values).
[n] Discretionary sources of calories (solid fats and added sugars) may be added to the meal pattern if within the specifications for calories, saturated fat, trans fat, and sodium. Foods of minimal nutritional value and fluid milk with fat content greater than 1 percent milk fat are not allowed.
[o] In the SBP, calories and trans fat specifications take effect beginning July 1, 2013 (SY 2013-2014).
[p] Final sodium specifications are to be reached by SY 2022-2023 or July 1, 2022. Intermediate sodium specifications are established for SY 2014-2015 and 2017-2018. See required intermediate specifications in § 210.10(f)(3) for lunches and § 220.8(f)(3) for breakfast

Appendix E: *Cooking for Kids* 3-Day Training Learning Outcomes

Learning Outcomes

DAY 1: CREATING TIME FOR HEALTHY MEALS

Nutrition: School Meals

- Explain how the Dietary Guidelines for Americans influence school meal patterns.
- Identify the five vegetable subgroups and which vegetables meet those subgroups.
- Explain how cooking method affects the nutritional value of a food.
- Explain what a whole grain is and identify food items that meet that definition.
- Identify methods for replacing salt in recipes while maintaining flavor.

Mise En Place

- Identify and demonstrate the definition and components of mise en place practices.
- Demonstrate proper timeline activities and practices.
- Explain the importance of utilizing advanced mise en place strategies in the kitchen.

Food Safety

- Identify produce items that require additional food safety practices.
- Explain the three basic food safety steps for handling fresh produce.
- Explain how to limit cross-contamination.
- Demonstrate proper kitchen safety techniques.

Knife Skills

- Demonstrate a medium dice, julienne, chiffonade and mince.

Flavor Training: Herbs and Spices

- Recognize the basic principles of smell and taste.
- Recognize a variety of herbs, spices, oils, vinegars and other flavorings.
- Use different herbs and spices to create or enhance natural flavors of food without added salt.
- Explain how to season a recipe while limiting salt and sugar.

DAY 2: DEVELOPING FOOD PREPARATION SKILLS

Standardized Recipes

- Identify the parts of a standardized recipe.
- Identify and apply simple kitchen measurement abbreviations.
- Recognize simple liquid and dry measurement devices.

Whole Grain Cookery

- Explain “al dente” as it relates to pasta.

- Prepare a standardized recipe using whole grains

Vegetable Cookery

- Explain the difference between roasting, braising, sautéing, and steaming.
- Prepare a cold kitchen recipe using vegetables.
- Prepare a recipe requiring roasting, sautéing or steaming vegetables.
- Practice seasoning vegetables while limiting salt and sugar.

Learning Outcomes

Professionalism

- Identify the quality factors that make up a professional lunchroom.

Social Media

- Identify two social media strategies that promote student participation.

DAY 3: INFLUENCING STUDENT PARTICIPATION AND FOOD CHOICES

Taste Training

- Identify the five tastes that contribute to flavors and sensory experience.
- Describe how texture, aroma and flavor affect food consumption.
- Explain the difference between a food aversion, taboo and preference.
- Explain the importance of understanding the aesthetic influence of food.

Smarter Lunchrooms

- Identify three Smarter Lunchroom strategies to influence students' selection of fruits and vegetables.
- Identify three Smarter Lunchroom strategies to influence students' selection of healthy entrees.
- Apply Smarter Lunchroom strategies to redesigning a school lunch line.
- Explain the importance of conducting taste-testing activities within a program.
- Identify key components to hosting a successful taste-testing event.

Appendix F: Level of Food Preparation & Food Preparation Technique Definitions

LEVEL OF FOOD PREPARATION OBSERVED- FALL 2015			
SCHOOL: **MENU MONTH: SEPTEMBER**			
Type of Preparation	**Total Observations**	**Total entrees prepared in month**	**Percentage**
Convenience			
Minimal preparation			
Almost Scratch (Fast Scratch)			
Made from Scratch			

LEVEL OF FOOD PREPARATION OBSERVED- FALL 2016			
SCHOOL: **MENU MONTH: SEPTEMBER**			
Type of Preparation	**Total Observations**	**Total entrees prepared in month**	**Percentage**
Convenience			
Minimal preparation			
Almost Scratch (Fast Scratch)			
Made from Scratch			

Food Preparation Technique Definitions

1. **Convenience** means the foods are fully processed and only require heating and serving. Examples include heat-n-serve macaroni and cheese and premade bean and cheese burrito.
2. **Minimal preparation** means assembly of ingredients that are highly processed. Examples include premade meatloaf with rehydrated mashed potatoes and chilidogs made with buns, hot dogs and canned beans and tomatoes for chili.
3. **Almost scratch** means some of the ingredients are raw and some mixing, cooking and preparation is involved. An example is chicken teriyaki made with precooked and sauced chicken strips, fresh rice and fresh vegetables.
4. **Made from scratch** means the ingredients are raw or close-to-raw, including unseasoned, pre-cooked meat. An example is chicken fajitas made with chicken strips, grilled, tortillas and fresh vegetables.

Appendix G: *Smarter Lunchrooms* Action Levels [46]

SMARTER LUNCHROOM ACTION LEVELS					
SCHOOL:					
Action Levels	**Fruit Level _____**	**Vegetable Level _____**	**Variety Level _____**	**Entrée Level _____**	**Reimbursable Meals Level _____**
1	Fresh fruit is under the sneeze shield in stainless steel pan	Vegetables are difficult to identify / see on the lunch line.	Only 1 fruit and 1 vegetable are offered.	One entrée choice	Reimbursable meal is not identifiable by staff or students and is not highlighted
2	Fruit is under sneeze shield. Fruit is in an attractive bowl or in clear portion cups.	Vegetables are moved to a highly visible area on the lunch line.	Two or more fruits and 2 or more vegetables are offered each day.	Choice of entrees	Reimbursable meal is offered in at least two meal service lines/locations
3	Fruit is in an attractive bowl or in clear portion cups, and in an easily reached location.	Vegetables have been given creative and age-appropriate names and are moved to a highly visible area on the lunch line.	Two or more fruits and 2 or more vegetables are offered each day and attractively displayed (simply garnished, arranged by color, portioned into clear cups, etc.).	At least one entrée is almost scratch or made from scratch	Reimbursable meal is offered in at least two meal service lines/ locations and has at least two different meal combination options
4	Fruit is in an attractive bowl or in clear portion cups, in a highly visible and easily reached location on the lunch line.	Creative and age-appropriate names are displayed next to the respective vegetable in a highly visible area on the lunch line.	Two or more fruits and 2 or more vegetables are offered each day, are attractively displayed and students can self-select as much as they want.	Place the almost scratch or made from scratch entrée first or most prominent in line.	Reimbursable meal is offered in all meal service lines/locations and has multiple combination options and is labeled
5	Fruit is in an attractive bowl or in clear portion cups, and in 2 highly visible and easily reached locations on the lunch line.	Creative and age-appropriate names are displayed next to the respective vegetables in a highly visible area on the lunch line and on menu boards in the cafeteria.	Two or more fruits and 2 or more vegetables are offered each day, are attractively displayed and students can self-select as much as they want.	Give targeted entrees creative and descriptive names. Display name signs beside the entrées.	Reimbursable meal is offered in all lines/locations, has multiple combination options, is labeled and highlighted on menu boards/posters
6	Fruit is in an attractive bowl or in clear portion cups, in 2 or more highly visible and easily reached location with one location being near the cash register.	Vegetables are displayed in at least 2 highly visible, easily accessible / highly trafficked areas and have creative and age-appropriate names displayed next to them and on menu boards.	Two or more fruits and 2 or more vegetables are offered each day, are attractively displayed and students can self-select as much as they want. Competitive snack foods are moved to a less convenient location in the meal service area.	Display the creative entrée names on a placard or menu board outside the cafeteria.	Reimbursable meal is offered in all meal service lines/locations, has multiple combination options, is labeled and highlighted on menu boards/posters in lunchroom and verbally cued by service staff

Appendix H: Menu Items Served at the Pilot Schools at Baseline and Post-Intervention

		School 1	School 2	School 3
Baseline (2014)	**Day 1**	Pepperoni pizza	Sloppy Joe sandwich	Chicken and rice
		Chicken tenders	Broccoli	Green beans
		Cheeseburger	Sweet potato waffle fries	Salad bar
		Potato wedges	Mandarin oranges	Fruit salad (banana, strawberry, pineapple)
		Salad bar		Banana
		Strawberry cups		
		Apple		
	Day 2	Pepperoni pizza	Fish nuggets	Philly cheese steak sandwich
		Chicken sandwich	Macaroni and cheese	Baked beans
		Cheeseburger	Salad greens w/zucchini and broccoli	Salad bar
		Potato wedges	Fruit cocktail	Canned pineapple
		Salad bar		Banana
		Baked beans		
		Apple		
		Orange		
Post-Intervention (2016)	**Day 1**	Chicken & Noodles	Chicken tetrazzini	Chicken strips
		Cheeseburger	Breadstick	French fries
		Chips	Diced pears	Whole Wheat toast
		Steamed broccoli	Baked okra	Strawberries
		Apple	Carrots/peas (canned)	Mandarin oranges
		Banana		Apple
		Strawberries (frozen)		Pineapple (canned)
		Salad bar		Salad Bar
		Fruit Juice (orange & apple)		
	Day 2	Chicken nuggets	Beef Tacos	Taco Soup
		Chicken sandwich	Cheese & lettuce (condiments)	Tortilla chips
		Chips	Fruit cocktail	Banana
		Apple	Pinto beans	Pineapple
		Banana		Orange slices
		Mashed potato & gravy		Grapes
		Steamed broccoli & carrots		Salad bar
		Salad bar		
		Fruit Juice (orange & apple)		

Appendix I: Oklahoma State University IRB Approval

Oklahoma State University Institutional Review Board

Date:	Tuesday, December 22, 2015	Protocol Expires:	1/22/2017
IRB Application No:	HE145		
Proposal Title:	Evaluation of Oklahoma School Nutrition Culinary Training Program: Impact on Student Consumption		
Reviewed and Processed as:	Exempt **Modification**		

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Bradyn B Powell
Stillwater, OK 74078

Deana Hildebrand
315 HES
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

Modification to 1) remove "Food and Labor Cost" from title, 2) remove Lillian Carl as PI as she has graduated and left the university, and add Bradyn Powell as PI 3) conduct the post plate waste study in Spring 2016.

Signature :

Hugh Crethar, Chair, Institutional Review Board

Tuesday, December 22, 2015
Date

VITA

Bradyn M. Powell

Candidate for the Degree of Nutritional Sciences

Master of Science

Thesis: *COOKING FOR KIDS: CULINARY TRAINING FOR SCHOOL NUTRITION PROFESSIONALS* REDUCES USE OF CONVENIENCE FOODS WITHOUT NEGATIVELY IMPACTING ENTRÉE, GRAIN AND FRUIT CONSUMPTION

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in August 2017.

Completed the requirements for the Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, OK in 2015.

Experience:

Graduate Research Assistant at Oklahoma State University for the *Cooking for Kids* program under the supervision of Dr. Deana Hildebrand

Presented research at the Oklahoma Academy of Nutrition and Dietetics Spring Convention Student Poster Session in April, 2017

Research abstract accepted to present at the Society for Nutrition Education and Behavior 50th Annual Conference Poster Session in July, 2017

Professional Memberships:

The Academy of Nutrition and Dietetics
The Oklahoma Academy of Nutrition and Dietetics